Space Exploration 2014
Strasbourg, France
Abstract

NASA's Automated Rendezvous and Docking/Capture Sensor Development and Its Applicability to the GER

Heather Hinkel, Scott Cryan, Christopher D'Souza PhD

NASA Johnson Space Center, Houston, TX 77058

Matthew Strube

NASA Goddard Space Flight Center, Greenbelt, MD 20771

This paper will address how a common Automated Rendezvous and Docking/Capture (AR&D/C) sensor suite can support Global Exploration Roadmap (GER) missions, and discuss how the model of common capability development to support multiple missions can enable system capability level partnerships and further GER objectives. NASA has initiated efforts to develop AR&D/C sensors, that are directly applicable to GER. NASA needs AR&D/C sensors for both the robotic and crewed segments of the Asteroid Redirect Mission (ARM). NASA recently conducted a commonality assessment of the concept of operations for the robotic Asteroid Redirect Vehicle (ARV) and the crewed mission segment using the Orion crew vehicle. The commonality assessment also considered several future exploration and science missions requiring an AR&D/C capability. Missions considered were asteroid sample return, satellite servicing, and planetary entry, descent, and landing. This assessment determined that a common sensor suite consisting of one or more visible wavelength cameras, a three-dimensional LIDAR along with long-wavelength infrared cameras for robustness and situational awareness could be used on each mission to eliminate the cost of multiple sensor developments and qualifications. By choosing sensor parameters at build time instead of at design time and, without having to requalify flight hardware, a specific mission can design overlapping bearing, range, relative attitude, and position measurement availability to suit their mission requirements with minimal nonrecurring engineering costs. The resulting common sensor specification provides the union of all performance requirements for each mission and represents an improvement over the current systems used for AR&D/C today. NASA's AR&D/C sensor development path could benefit the International Exploration Coordination Group (ISECG) and support the GER mission scenario by providing a common sensor suite upon which GER objectives could be achieved while minimizing development costs. The paper will describe the concepts of operations of these missions and how the common sensors are utilized by each mission. It will also detail the potential partnerships and contribution of the International community in the development of this common AR&D/C sensor suite.